In case you’re wondering:

There are no handouts for this class.

We start with a cell.
And what’s inside the nucleus.

2% DNA GENES

THE HUMAN GENOME

all cells in your body have the same genome.

different genes are activated – or deactivated – at different times of life
or during different events.

healing touch
Releases oxytocin

Try it

‘TEND & BEFRIEND’ hormone

Why activate genes?
Genes make proteins.

That’s ALL genes do.

Proteins identify cells.

Enable communication

Keep the gears of metabolism moving.

Do the work of the cell.
Nothing happens in the body without proteins.

20% of body weight.

230,000 – 2,500,000

23,000 genes give or take a few thousand.

NOTHING happens in any cell

Zip NADA
or 2 or 3 or 4 or more.

unless a gene is involved.

Genes are naturally DUMB.

Not stupid. Silent.

Genes must be TOLD what to do.

The EPIGENOME directs genes in skin cells

WITHOUT changing DNA sequence
The most common form of epigenetic mechanisms

METHYLATION
DEDEMETHYLATION

Act like a series of molecular “earrings” decorating the genome without changing it.

. . . turning genes on or off up or down

HISTONE MODIFICATION
MICRO RNA’S
CHROMATIN REMODELING

(Other epigenetic mechanisms to know for future reference.)

Every cell has its own epigenome.

70 trillion
Every cell type shares an epigenome.

We’re now realizing...

**MethyloMe**
Pattern (aka: ‘epigenetic landscape’) of methyl groups

*Some* skin care ingredients

**direct** genes in skin cells.
TAKE HOME MESSAGE:
ANYTIME gene regulation occurs it’s via epigenetic mechanisms.

Don’t tell your clients.

Because you’ll be making drug claims.

Drug Claim Territory

Cosmetic Claim Territory

how
what
how long

NEW Clinique Smart Custom-Repair Serum
A serum smart enough to understand your skin’s past and change its future.
Why target genes in skin cells?

Because as we all KNOW

Gene activity changes with AGE & LIFESTYLE choices.

Sex sells.

So do results.

Your cells form molecular “memories” of every experience in your life.

Tanning & Smoking
What have I been thru? How did I survive? Let's do that again!

Negative environments wipe away the tags

As do negative emotions

The exploration of epigenetics opens up a new door to intentionally effective skin care
Healthy Foods
... based on lifestyle choices rather than skin type.

Epigenetic Dietary Components
- **EGCG** (green, oolong & white teas, carob, pecans, hazelnuts, cranberries)
- **Sulforaphane** (cruciferous veggies: broccoli, cabbage, Brussels sprouts, kale, cauliflower, etc)
- **Genistein** (soy, fava beans, kudzu)
- **Curcurmin** (turmeric)
- **Resveratrol** (grapes, berries, peanuts, Japanese knotweed)

皮肤护理在过去已经影响了基因表达，但没有“意图”。

**UNTIL NOW**

有时我们会得到结果。

基因定向（表观遗传激活）成分故意影响。

**Sometimes we get results**

**Gene targeted (epigenetically active) ingredients INTENTIONALLY influence.**

More often we don’t.

**UNTIL NOW**

皮肤护理已经影响了基因表达，但没有“意图”。

**Gene targeted (epigenetically active) ingredients INTENTIONALLY influence.**

More often we don’t.
Unleashing skin’s potential to recover from aging – and other events.

**Gene Targets?**

- **40** Collagen Genes
- **200** Antioxidant Genes
- **400** Inflammation Genes
- **700** Hydration Genes
Aging is now believed to be an epigenetic phenomena – largely a result of the wrong genes being turned on and the right ones being turned off. The right epigenetic choices may reverse some of this trend.
What you pay attention to determines what you miss.

CANCER

Genes are (usually) named for the Proteins or Peptides they produce.

<table>
<thead>
<tr>
<th>PROTEIN</th>
<th>GENE NAME</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collagen III</td>
<td>COL3</td>
<td>Dermal proteins</td>
</tr>
<tr>
<td>NFkB</td>
<td>NFKB</td>
<td>Dermal protein</td>
</tr>
<tr>
<td>Wnt1</td>
<td>WNT1</td>
<td>Direct growth</td>
</tr>
<tr>
<td>Nrf2</td>
<td>KEAP1</td>
<td>Longevity enzymes</td>
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<tr>
<td>Beta-Defensin-2</td>
<td>DEFB2</td>
<td>Antimicrobial protein</td>
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<tr>
<td>Phospholipase A2</td>
<td>PLA2</td>
<td>Inflamm'aging</td>
</tr>
<tr>
<td>NFkB</td>
<td>NFKB</td>
<td>Crosslinks proteins</td>
</tr>
<tr>
<td>Lysyl Oxidase</td>
<td>LOX</td>
<td>Maintains elastin</td>
</tr>
<tr>
<td>Lysyl Oxidase Like</td>
<td>LOXL</td>
<td>Water channels</td>
</tr>
<tr>
<td>Aquaporins</td>
<td>AQP + number</td>
<td>Produces NMF</td>
</tr>
<tr>
<td>Filaggrin</td>
<td>FLG</td>
<td>Allows DNA repair</td>
</tr>
<tr>
<td>P53</td>
<td>P53</td>
<td>Triggers telagentasia in rosacea</td>
</tr>
<tr>
<td>Vascular Endothelial Growth Factor2</td>
<td>VEGF2</td>
<td>Cell signalling proteins</td>
</tr>
</tbody>
</table>

**ENDOGENOUS ANTIOXIDANTS**

- **Collagen** III, NFkB, Wnt1, Nrf2

**Genes**

**Proteins**

**Cellular Antioxidants**

- CAT
- SOD
- GSH
- KEAP1

Triggers cellular antioxidant production
ASTAXANTHIN

KEAP1 up-regulates Master Detoxifying Transcription Factor

Nrf2

Genes turned on by Nrf2

200+

Antioxidant Enzymes
Detoxifying Enzymes
Cell Protective Proteins
Block DNA Damage

Sulforaphane in Garden cress sprouts & cruciferous veggies

Activates Nrf2

Protecting skin & DNA from toxic oxygen radicals & pollutants.

Wash off after smog exposure

CATHELICIDINS

Natural anti-microbial peptides released by neutrophils control pathogens in pores & on skin.
Stress turns down gene production of cathelicidins.

Meadowsweet (spirea ulmaria) strengthens skin's natural defense system.

Considerations:
Preservatives
Benzoyl Peroxide
Question for Researchers
Are the microbiome & epigenome related?

AQUAPORINS
Protein channels

AQUAPORINS
are like aqueducts through cell membranes

3,000,000,000 water ions per second

1000s per cell membrane

Decline with age per cell membrane
**AQPs**

aquaporin genes

3.5Xs AQP3
(channels water + glycerin)

11Xs AQP9
(channels water + NMF)

2Xs AQP10
(channels water)

AQUAPORINS can be activated and rebuilt.

© Chemyunion Aquasense®

15 minutes
Wnt Proteins pass messages across cell membranes

New emulsifier turns on AQP & WNT genes

Polyglyceryl-10 Mono/Dioleate (and)
Polyglyceryl-3 Oleate (and) Glycerin (and) Phosphatidylglycerol

Do other emulsifiers act epigenetically?
Rete Ridges (AKA PEGS)

Beta-1 Integrin, Alpha 6-Integrin, Keratin 15

Anchor stem cells rete pegs

48 hours elapse

Survivyl IS®  © International Specialties Group

<table>
<thead>
<tr>
<th>Control</th>
<th>Survivyl IS 0.5%</th>
<th>Survivyl IS 1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>7%</td>
<td>52%</td>
<td>80%</td>
</tr>
</tbody>
</table>

48 hours

Firm & Tighter

Lose & Sagging
ANY Ingredient that upregulates a gene that results in a protein is doing so...

Via Epigenetic Mechanisms

Gene regulation gives us power to change the skin.


The formula can make the difference.

Tests for epigenetic activity are simple.
Reading & analyzing the results aren’t.

Test for protein expression or down-regulation.

Test for end results.

As with cancer, it will probably be determined that ALL SKIN CONDITIONS—aging, acne, rosacea, cellulite, inflammation, pigmentation, allergies, wound healing—have a strong epigenetic component.

What about ‘eco’ toxicants?

ECOTOXICANTS are “most likely” changing the epigenomes of humans & animals & insects & plants & bacteria.
Feminizing effect on male babies
Increase in certain forms of cancer in females and males
Alterations in male organs
Increase in diabetes, obesity, cardiovascular disease, asthma, etc, etc, etc

Time of exposure during fetal development influences impact of epigenetic effects.

Testing at only one stage of development may prevent identification of teratogens.

Bisphenol A
Parabens
Phthalates
Formaldehyde
1,4 dioxane
Dihydrocoumarin (sweet clover)
Phytoestrogens
Carcinogenic contaminants in petrolatum, mineral oil & other petrochemicals

BISPHENOL A
(an endocrine disruptor)
Genetically identical
Same age
Both mothers fed normal diet with Bisphenol A

Thin mouse mom supplemented with methyl-donating
Betaine
Vitamin B12
Folic Acid
Choline

Randy Jrtle/Duke University
In a study of 205 healthy volunteers, those who frequently dyed their hair showed greater methylation in their blood. - Epigenetics, July 2011

National Toxicology Program (NTP) universities & privately funded studies are researching the epigenetic effects of the potentially most dangerous ecotoxicants.

To learn more...
‘OMICS’ OPPORTUNITIES IN SKIN CARE

1. GENOMICS VS PROTEOMICS
2. THE EPIGENOME: MASTER OF THE GENOME
3. PROTEOMICS AS A PARADIGM
4. NEW FUNCTIONAL & CHEMICAL PROTEOMICS METHODS & STRATEGIES
5. EXPLORING THE METABOLOME EFFECTIVELY TO ADVANCE SKIN CARE RESEARCH

October 13, 2015
$45 members
$95 non-members
$25 students

REBECCA Gadberry
rebeccagad71954@gmail.com

Thank you!